American Foundryman

A PUBLICATION PRESENTING ASSOCIATION AND CHAPTER ACTIVITIES

Courtesy Sloan Valve Co.

olla, Iowa and Purdue Conferences To Be Held October -8, 14-15 and 27-29 Respectively—For Programs of Confer- nces See Pages 2-5 Inclusive.

September
1938

Chapter Activities

SEVERAL YEARS AGO, the American Foundrymen's Association began the organization of Chapters in many sections of the country. The thought behind the organization of these Chapters was to bring the activities of A.F.A. more closely to the foundrymen. This movement proved a master stroke.

Through its Chapters, A.F.A. has been able to render direct service to the various foundry districts in the United States to the extent that Chapter work has grown to be the outstanding concomitant interest of almost every foundryman.

During the past several years, there has been in motion a continuous effort to improve products and processes, thereby raising operating efficiency in the foundry industry. These improvements have been passed on to the foundrymen through their local Chapters of A.F.A. The improved methods—results of research work in certain sections—have been laid at the feet of the other sections through the medium of A.F.A. Chapters.

Great technical organizations have been able to disseminate their vast amount of information, all sections of the country have access to their ideas, and sundry program committeemen of A.F.A. have been able to secure reputable men along metallurgical, sand control and foundry practice lines for guest speakers at A.F.A. meetings through Chapter activities.

The educational programs of Chapters not only have tended to improve the quality of foundry products but Chapter committee activities, cooperation with other societies and social events have won a new respect for the industry in many communities. It might be said, that the Chapters have instilled a new spirit of pride in the industry among foundrymen themselves.

Much has been gained by the southern foundrymen's affiliation with A.F.A. through the Birmingham District Chapter. This district is rather removed from the great foundry producing areas, but the experience and knowledge of the whole Association are brought to our very door steps through the local A.F.A. Chapter. What is true with the Birmingham Chapter is also true with all other A.F.A. Chapters.

L. N. Shannon

Director, A.F.A.

Mr. Shannon is vice president, Stockham Pipe Fittings Co., Birmingham, Ala., and was instrumental in forming, and was the first Chairman of, the Birmingham District Chapter of the American Foundrymen's Association. He is now serving as a director of that organization. In addition to his directorship in A.F.A., he also is a member of the executive committee of the Board of Directors.

American Foundryman

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September, 1938

Volume I — No. 3

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Rolla, Iowa, and Purdue Regional Conferences To Be Held in October

OCTOBER will be a busy month for foundrymen throughout the Middle West. During this period Regional conferences will be held at Rolla School of Mines and Metallurgy, Rolla, Mo., on October 7 and 8, under joint sponsorship of the Rolla School and the St. Louis District Chapter; the following week, on October 14 and 15, the third annual foundry conference at the State University of Iowa, Iowa City, Iowa, will be held under the joint sponsorship of the Quad City Chapter of A.F.A., the University, the Northern Illinois-Southern Wisconsin Chapter of A.F.A. and the Northern Iowa Foundrymen's Association; the third conference will be the first sponsored by the Chicago Chapter and will be held at Purdue University, LaFayette, Ind., on October 27, 28 and 29.

These meetings are designed to serve several purposes. They offer an opportunity for foundrymen who could not attend the annual convention to get together and discuss their mutual problems; they promote a better understanding between engineering staffs and students at universities and colleges and the foundrymen of the district; they further a better understanding of the utility of cast products among engineers and students; and they bring foundrymen together and promote acquaintanceship and discussion of current foundry practices.

Rolla Conference Program

THE program which will be presented at the Rolla School of Mines and Metallurgy on October 7 and 8, was prepared by a committee consisting of L. J. Desparois, Pickands-Mather & Co., *Chairman;* G. S. Haley, Century Foundry Co.; G. W. Mitsch, American Car & Foundry Co.; C. R. Culling, Carondelet Foundry Co.; Webb Kammerer, Midvale Mining & Mfg. Co.; J. W. Kelin, Federated Metals Division, American Smelting & Refining Co.; G. E. Mellow, Liberty Foundry Co.; W. C. Bliss, Scullin Steel Co.; J. O. Klein, Southern Malleable Iron Co., and R. K. Durkan, M. W. Warren Coke Co., all of St. Louis. The program is as follows:

Friday, October 7

8:00-9:00 AM Registration — Metallurgy Bldg., Club Room.

9:30-12:00 AM Cupola Practice—Parker Hall.

Chairman: G. W. Mitsch, American Car & Foundry Co., St. Louis, Mo.

Mechanical Charging With Cupola Control as Practiced at the Caterpillar Tractor Co.—M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill.

Operation of Hot Blast Cupola—A. O. Nilles, Griffin Wheel Co., Kansas City, Kans.

9:30-12:00 AM Non-Ferrous and Malleable — Metallurgy Bldg.

Chairman: J. O. Klein, Southern Malleable Iron Co., East St. Louis, Ill.

Malleable

Malleable Iron, Its Composition and Manufacture—Leon Wise, Chairman, Research and Development Committee of the Malleable Founders' Society.

Short Cycle Anneal—Hyman Bornstein, Deere & Co., Moline, Ill.

Non-Ferrous

Choosing and Using Non-Ferrous Alloys—J. W. Kelin, Federated Metals Division, St. Louis, Mo.

12:30 PM Luncheon—Long Hotel.

Address by St. Louis District Chapter Chairman, J. O. Klein, Southern Malleable Iron Co., East St. Louis, Ill.

Safety in Foundries—J. O. Johnson, American Optical Co., St. Louis, Mo.

2:00-4:30 PM Joint Assembly—Parker Hall.

Address of Welcome: William R. Chedsey, Director, Missouri School of Mines, Rolla, Mo.

2:00-4:30 PM Sands and Refractories.

Chairman: L. C. Farquhar, American Steel Foundries, East St. Louis, Ill.

Sands

Testing and Control of Molding Sands—H. W. Dietert, Harry W. Dietert Co., Detroit, Mich.

Molding Sand Problems in the Foundry — Horace Deane, Deere & Co., Moline, Ill.

Refractories

Limitations of Refractories for Foundry Use—M. C. Booze, Chas. Taylor Sons Co.

6:30 P M Dinner—Pierce Pennant Hotel.

Chairman: G. S. Haley, Century Foundry Co., St. Louis, Mo.

Introduction of National Officers.

Speaker: L. P. Robinson, The Werner G. Smith Co., Cleveland, Ohio.

Saturday, October 8

9:00-12:00 AM Gray Iron and Metallurgy — Parker Hall.

Chairman: C. R. Culling, Carondelet Foundry Co., St. Louis, Mo.

Limitations of the Spectrograph—S. R. B. Cook, Professor, Missouri School of Mines, Rolla, Mo.

Practical Application of Metallography—Carl H. Morken, Carondelet Foundry Co., St. Louis, Mo.

Old Iowa State Capitol on State University of Iowa Campus.

9:00-12:00 AM Steel—Metallurgy Bldg.

Chairman: W. Carter Bliss, Scullin Steel Co., St. Louis.

The Manufacture of Steel Castings for High Pressure, High Temperature Service—Lee Everett, Key Co., East St. Louis, Ill.

Blow Holes in Steel Castings—Joseph D. Walsh, Scullin Steel Co., St. Louis.

Afternoon—Football Game: Missouri School of Mines vs. Chillicothe Business College.
Golf.

University of Iowa Conference Program

THE program to be presented at the Iowa conference on October 14 and 15 was developed by a committee of the Quad City Chapter consisting of Horace Deane, Deere & Co., Moline, Ill., *Chairman;* Harry Henninger, International Harvester Co., Rock Island, Ill., and T. J. Frank, Frank Foundries, Inc., Davenport, Iowa, in cooperation with Prof. H. O. Croft, Department of Mechanical Engineering, University of Iowa, and A. V. O'Brien of the University's extension division. The program for the conference is as follows:

Friday, October 14

9:00 AM Registration—Chemistry Building, State University of Iowa, Campus.
(All sessions to be held in Chemistry Building Auditorium.)

9:00 AM Opening Meeting.

Chairman: P. T. Bancroft, Moline, Ill.

Address of Welcome: Dean F. M. Dawson, College of Engineering.

10:00 AM Practical Sand Problems and Their Remedies.

Chairman: R. Holland, International Harvester Co., Rock Island, Ill.

Core Room Problems—L. P. Robinson, Werner G. Smith Co., Cleveland, Ohio.

Curing Casting Defects Due to Sand—H. W. Dietert, Harry W. Dietert Co., Detroit, Mich.

2:00 PM Practical Metal Problems and Their Remedies.

Non-Ferrous

Chairman: H. E. Alex, Rock Island Arsenal, Rock Island, Ill.

Defects in Non-Ferrous Castings—C. V. Nass, Fairbanks-Morse & Co., Beloit, Wis.

Intermission—3:20 PM.

Gray Iron

Chairman: A. E. Hageboeck, Frank Foundries, Inc., Moline, Ill.

Producing Good Gray Iron—M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill.

6:30 PM Conference Dinner—River Room, Iowa Union Building.

Addresses:

H. Bornstein, Past President of A.F.A. and Director of Laboratories, Deere & Co., Moline, Ill.
Eugene Gilmore, President, State University of Iowa.

Prof. H. O. Croft

Saturday, October 15

8:30 AM Equipment Problems and Methods.

Chairman: John H. Ploehn, French & Hecht, Inc., Davenport, Iowa.

Pattern Problems—J. E. Kolb, Caterpillar Tractor Co., Peoria, Ill.

9:40 AM Refractories.

Chairman: John H. Diedrich, Blackhawk Foundry & Machine Co., Davenport, Iowa.

Monolithic Linings—R. E. Wilke, John Deere Tractor Co., Waterloo, Iowa.

10:30 AM Molding Problems.
Chairman: Fred Kirby, John Deere Spreader Works, Moline, Ill.

Molding Equipment — W. R. Jennings, John Deere Tractor Co., Waterloo, Iowa.

Afternoon—Recreation, Golf.

Purdue University Conference Program

THE regional meeting at Purdue University is the first sponsored by the Chicago Chapter. A large committee, personnel of which was given in the July issue of *American Foundryman,* has worked on the program in conjunction with a committee from the University consisting of Assistant Dean of Engineering W. A. Knapp, Prof. J. L. Bray, head of the School of Chemical Engineering, Prof. Beese, head of the School of General Engineering, Prof. G. A. Young, head of the school of Mechanical Engineering, and Prof. D. E. Ackerman of the department of metallurgy. The program scheduled tentatively for presentation at the Purdue Conference on October 27, 28 and 29, is as follows:

Thursday, October 27

9:00 AM Registration—Union Building Lobby.

9:45 AM General Session—Union Ball Room.
Chairman: H. W. Johnson, Greenlee Foundry Co., Chicago, Ill.
Address of Welcome:
On Behalf of University—Dean A. A. Potter, Dean of Engineering, Purdue University.
On Behalf of Chicago Chapter—L. H. Rudesill, Griffin Wheel Co., Chicago, Ill., Chairman, Chicago Chapter A.F.A.
On Behalf of A.F.A.—R. E. Kennedy, Secretary, A.F.A.

10:30-12:15 PM Gray Cast Iron—Faculty Lounge, Union Building.
Technical Chairman: H. K. Briggs, Western Foundry Co., Chicago, Ill.
Subject: Cupola Raw Materials
Some Concepts of Raw Materials—R. H. Bancroft, Perfect Circle Co., Hagerstown, Ind.
Foundry Coke and the Cupola—B. P. Mulcahy, Citizens Gas & Coke Utility, Indianapolis, Ind.
Materials Handling—L. D. Reed, Whiting Corp., Harvey, Ill.
Refractories—Carl Wirth, Terre Haute Malleable & Mfg. Co., Terre Haute, Ind.

Malleable Iron—Tower Room, Union Building.
Technical Chairman: L. H. Rudesill, Griffin Wheel Co., Chicago, Ill.
Subject: Melting Practices and Materials of Melting.
Conventional Air Furnace — P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill.
Duplexing—J. O. Klein, Southern Malleable Iron Co., St. Louis, Mo.
Brackelsburg Furnace—J. H. Lansing, Malleable Founders' Society, Cleveland, Ohio.

Steel—Rooms 1 and 2, Union Building.
Technical Chairman: C. E. Westover, Burnside Steel Foundry Co., Chicago, Ill.
Manufacture and Application of Steel Castings (Illustrated Lecture — Students especially invited), by H. A. Forsberg, Continental Roll & Steel Foundry Co., East Chicago, Ind.

12:30 PM Luncheon—Union Building Cafeteria.

2:00-4:00 PM Gray Cast Iron—Faculty Lounge, Union Building.
Technical Chairman: G. P. Phillips, International Harvester Co., Chicago, Ill.
Cupola Melting Operations—John L. Lowe, Centrifugal Fusing Co. Div., Campbell Wyant & Cannon Foundry Co., Lansing, Mich.

Malleable—Tower Room, Union Building.
Technical Chairman—B. C. Yearley, National Malleable & Steel Casting Co., Chicago, Ill.
Subject: Annealing Practices
Conventional Practice—L. E. Roby, Jr., Peoria Malleable Iron Co., Peoria, Ill.
Pressure Type Practice—C. C. Lawson, Wagner Malleable Iron Co., Decatur, Ill.
Short Cycle Practice—W. D. McMillan, International Harvester Co., Chicago, Ill.

Steel—Rooms 1 and 2, Union Building.
Technical Chairman: Bert Aamodt, National Malleable & Steel Castings Co., Chicago, Ill.

Michael Golden Shops, Where Some Sessions Will Be Held

Subject: Methods of Melting

Converter—F. B. Skeates, Link-Belt Co., Chicago, Ill.

Electric Furnace—Al. Gierach, American Manganese Steel Co., Chicago Heights, Ill.

Open-Hearth—John W. Porter, American Steel Foundries, East Chicago, Ind.

6:30 P M Dinner—Union Building Ball Room.

Presiding: L. H. Rudesill, Griffin Wheel Co., Chairman, Chicago Chapter A.F.A.

Speaker: Dr. J. L. Bray, Head, School of Chemical and Metallurgical Engineering, Purdue University—"Sword Fishing."

Entertainment: Purdue Glee Club.

Friday, October 28

9:30-11:30 AM Gray Cast Iron — Faculty Lounge, Union Building.

Technical Chairman: J. D. Burlie, Western Electric Co., Chicago, Ill.

Subject: Casting, Defects, causes and Remedies

Casting Defects Due to Sand—A. W. Weston, Chicago Hardware Foundry Co., North Chicago, Ill.

Discussion on Hot Sand Theory—M. A. Scott, Greenlee Foundry Co., Chicago, Ill.

Casting Defects Other Than Sand—Martin Lefler, Oliver Farm Equipment Co., South Bend, Ind.

Malleable Iron—Tower Room, Union Bulding.

Technical Chairman: G. B. Stantral, Illinois Malleable Iron Co., Chicago, Ill.

Subject: Casting Defects, Their Causes and Remedies.

L. F. Hartwig, Chicago Malleable Castings Co., Chicago, Ill.

H. W. Dietert, H. W. Dietert Co., Detroit, Mich.

Steel—Rooms 1 and 2, Union Building.

Technical Chairman: A. W. Gregg, Whiting Corp, Harvey, Ill.

Casting Design—C. W. Briggs, Steel Founders' Society of America, Cleveland, Ohio.

Steel Casting Properties—F. A. Melmoth, Detroit Steel Casting Co., Detroit, Mich. (Students especially invited.)

12:00 Noon—Luncheon, Union Building Cafeteria.

2:00-4:00 PM General Session.

Technical Chairman: L. F. Lottier, Peoples Gas, Light & Coke Co., Chicago, Ill.

Metallography for the Practical Foundryman—Prof. R. L. Farabee, Purdue University, Lafayette, Ind.

Saturday, October 29

9:00-12:00 AM Demonstrations.

a. Rapid Methods of Chemical Analysis—Chemistry Building Auditorium.
   1. Spectrographic Analysis.
   2. Rapid Chemical Analysis.
b. Physical Testing—Civil Engineering Building, Under Direction of Prof. R. B. Crepps.
   Tensile Strength, Yield Point, Transverse Strength, Deflection, Impact Testing, Torsion, Bending, Hardness .

Afternoon—Golf.

Inspection tours through the University will be organized at any time during the conference when a sufficient number are interested.

Quarterly Transactions Mailed

THE FIRST ISSUE of the new quarterly *Transactions* of the American Foundrymen's Association, containing papers and discussions presented at the 1938 Cleveland Convention, has been mailed to members. Included in the September issue are the following papers with discussions: "Atmosphere Control in Annealing Malleable Iron," by E. G. DeCoriolis and R. J. Cowan; "A Description of the Age Hardening Process as Applied to Castings," by L. W. Kempf; "Production and Properties of Age Hardenable Five Per Cent Nickel-Bronze Castings," by T. E. Kihlgren; "Effect of Aluminum on the Properties of Medium Carbon Cast Steel," by C. E. Sims and F. B. Dahle; "The Effect of Deoxidation Treatments on the Ductility of Cast Steels," by A. P. Gagnebin; "Refractories for Foundry Ladles," by C. E. Bales and A. R. Blackburn; "Cupola Operation," by D. J. Reese; "Foundry and Laboratory Characteristics of Cupola Coke—Resume," by J. A. Bowers; "Importance of Maintenance to Foundry Operations," by W. C. Bliss; and "Risers and Gates for Some Special Non-Ferrous and Alloyed and High Test Iron Castings," by C. Brisbois and A. E. Cartwright.

Additional copies of the September quarterly issue are available to members at 75 cents per copy and to non-members at $4.00 per copy.

Book Review

Foundry Sands, by T. R. Walker, 1938 edition, cloth bound brown, 10 chapters, 134 pages, 22 illustrations, 7 micrographs, 41 tables, published by Charles Griffin & Co. Limited, 42 Drury Lane, W. C.2, London, England.

This book combines foundry technique with scientific thought and replaces empericism by system. It describes the various methods of sand control that are being advanced in Great Britain with regard to the physical properties. The author compares A.F.A. and British standards and apparatuses. Curves and tables of data are given to show the results of experiments on British sands. The book is descriptive and of particular interest to metallurgists and students studying sand control as it compares British and American foundry practices.

An Error

IN the August issue of *American Foundryman,* John C. McCallum, new director of the Buffalo Chapter, was erroneously listed in the Chapter Directory as being associated with the Lumen Bearing Co., Buffalo. Mr. McCallum is not connected with that company but is president and general manager, McCallum-Hatch Bronze Co., Buffalo.

Courtesy Elliott Service Co., 219 E. 44th St., New York, N. Y.

Safety

More Respect for Low Voltage

By E. W. Beach,* Muskegon, Mich.

The following is a discussion of the hazards of low voltage in foundries. The entire article is a correlation of data and text material supplied by the Safety Department, Consumers Power Company of Michigan, which has been enlarged by the author.

TOO MANY workmen seem to think that 120 and 240-volt service is harmless and negligible as a cause of personal injury. Though they have proper respect for 480 and higher voltages required for large motors and melting furnaces, they seem inclined to careless handling and maintenance of conductors and other equipment energized at the lower potentials used for lighting, portable motor-driven tools and small heating devices. Records of serious and fatal accidents from contact with these low voltages should refute this delusion.

It may be stated as a general safety proposition that no electric current derived from a lighting or power circuit, at any voltage used in commercial or industrial distribution, should ever be allowed to pass through the human body. The tissues and nerves will not withstand the impact of even the lowest commercial voltages and any appreciable current passing through them may produce serious results. The skin forms a resistive coating over the moist internal tissues, but it is by no means a non-conductor. If the resistance of the skin is lowered by moisture, the amount of current that will flow through the body is increased. While 70 or 80 milliamperes is considered by medical authorities as more current than the normal person can withstand without danger, wetting the skin, by water or perspiration, so reduces the resistance that at 120 volts, 100 milliamperes may flow through the body and this *may* be fatal.

Effects of Electricity on Body

The passage of electricity through the body produces two general effects, electric shock and burns. A severe shock may affect the body in two ways, paralysis of the respiratory center, which renders the victim unconscious, stops his breathing and leaves him apparently dead; and fibrillation of the heart muscles, which is very likely to occur in low voltage shock. If temporary paralysis of the respiratory center is the extent of the injury, the prompt and continued application of the Schafer prone pressure method of resuscitation (artificial respiration) may restore breathing and consciousness. If the heart is affected, recovery is extremely doubtful.

There is no way by which the layman can determine whether the heart is affected, so in every case where breathing has stopped, the prone pressure method must be applied immediately, within 3 minutes if at all possible, and kept up without interruption until natural respiration is restored, or until rigor mortis has set in. Sometimes victims of electric shock have been saved after several hours of application of the prone pressure method.

Of course, a physician should be summoned at once and on arrival he becomes responsible for the case, but do not wait for him before beginning the application of the prone pressure method. Do not wait for any apparatus to be brought. *It is the first few minutes that count.* Several men in each department should be trained in application of the prone pressure method, which is very simple and can be learned in a single demonstration.

Electric burns are given the same first aid treatment as other burns and then, of course, turned over to the doctor.

Don't Take Chances With Low Voltage

The results of many contacts with electrical conductors, energized at low voltage, show that such contacts cannot be made with impunity, yet some men think they "can take it" and it is hard to convince them that they should not take chances. Of course, not every shock from low voltages has serious results. With the tough skin in the palms of men doing hard, rough work, a healthy, robust physical condition, and perhaps an imperfect contact for a fraction of a second, a low voltage shock may seem of little consequence. However, the records of industrial and home accidents indicate that low voltage can, and frequently does, produce serious or fatal consequences. If the shop electrical system has been properly de-

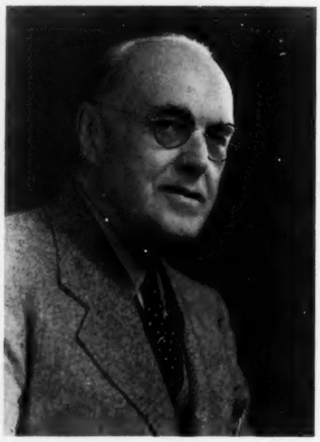
*Engineering Executive, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.

signed and installed, and is well maintained, there is no reason why such accidents should occur.

Grounds Are Important

In a certain foundry, a workman was killed when he grasped a wire rope that controlled an elevator used to lift wheelbarrows to the charging platform of the cupola. A test showed a potential of 240 volts between the rope and cast iron floor plates supported on the steel framework of the building. A ground had developed in another part of the building. When another ground fault occurred in the elevator hoist motor, the entire hoist frame became energized. The hoist was set on a wood foundation on top of the brick wall of the elevator structure, so was effectually insulated from the structural steel of the building.

Had the motor frame been grounded, as it should have been, the trouble would have been cleared and



E. W. Beach, Engineering Executive, Campbell Wyant & Camion Foundry Co., Muskegon, Mich.

indicated at once by blown fuses. As it was, a circuit from phase to phase was completed through the workman's hands and feet, sweat-moistened leather and shoe nails being good conductors, with fatal results.

Another instance of electrocution, under the author's own observation, was the death of a molder using an extension light. He was killed instantly by reason of worn-out insulation of the electric cord. A contributing condition was that he was standing in a muddy spot of molding sand left from the wetting down of his heap.

In the modern shop installation, where all permanent wiring is enclosed in conduit or by other approved means kept out of reach of production workers, there is little direct exposure of operatives to injury from direct contact with the permanently installed electric conductors. Where there is any stationary equipment with which electric contact can be made, it should be, and usually is, guarded adequately and the hazard indicated by suitable danger signs. If all exposed non-current-carrying metal parts of electrical equipment are solidly grounded, such an accident as the one cited could not occur. Modern wiring, properly installed according to approved and required methods, is safe and reliable, but to keep it so, every fault must be run down and repaired as soon as it is discovered.

Play Safe With Bare Wires

There are a few parts of the plant where complete isolation or enclosure cannot be maintained. An overhead crane takes its power from bare wires strung along the crane and bridge rails. Men climbing to the crane must pass close to these wires. Where this cannot be avoided, a substantial insulating guard between the ladder and the exposed conductors should be used. Material and tools should be raised and lowered with a handline. When work is to be done near the wires, they must be completely disconnected from the source of energy. If the crane is low enough so that by any chance workmen might contact the wires with long rods or pipes that they may be handling, great care should be used in instructing them to keep such objects below the level of the wires.

Welding Safety

Where electric welding is done, care must be used to keep entirely clear of the exposed energized parts. While the welding voltage is low, from 15 to 45 volts, it may go as high as 50 to 120 volts on open circuit. Not only the welder, but those working in the vicinity, should keep away from the exposed conductors. The main hazard in arc welding is from the intense light and heat rays given off by the arc, but there is the possibility that a sweating workman, especially if not in the best physical condition, might suffer serious burns or shock from contact with even these low voltages. Where welders are moved about from place to place, it is customary in some plants to have the electrical outlets out of reach of the department employees.

Portable Tools Constitute Hazard

Portable lamps, drills and chippers are usually connected to the permanent conductors by an attachment plug and cord. It is in this part of the equipment that most of the hazard to the production worker is found. Most of these small units and lamps are operated on 120-volt single phase alternating current, derived from the 240-volt secondary of a service transformer, the neutral conductor connected to the center tap of the secondary winding being grounded. This grounded neutral forms one side of the single phase circuit, providing 120 volts from either end of the winding to the neutral or to any ground, such as a water or air pipe, the steel frame of the building or any other conductor that is connected to ground. If contact between neutral and ground is made, nothing happens; but there is full voltage from the other conductor to any ground, as may be demonstrated by lighting a lamp between the "hot" wire and the building frame. Even if the current is derived from an ungrounded circuit, there may be a voltage to ground that is not to be handled carelessly.

The insulation on the portable cord, if intact, is safe protection from 120 volts. Any dry, clean non-conductor, such as rubber and rubber compounds, porcelain, glass, dry wood, fiber, bakelite, electric tape, treated cloth or paper, will prevent the flow of 120-volt current. The serious hazard is from direct contact with the exposed conductor, when standing on a ground, or when so close to the grounded conductor or other ground, that contact may thoughtlessly be made with it.

One may handle 120 volts standing on a dry board, but if the board has nails in it, they may make a grounded contact. Leather or fabric gloves are not safe insulating protection. While clean, dry leather, without cuts or punctures, may withstand 120 or 240 volts, a glove damp with perspiration or water, or filled with chips of metal or other conductor provides little or no insulation.

Grounding Portable Tools

As has been mentioned, grounding the non-current-carrying metal parts of the portable tool will shunt the current around the user if the parts handled become energized through breakdown of internal insulation. This grounding is accomplished through use of a three-conductor cord or an extra conductor secured to the ordinary cord. The third conductor is attached to the frame of the tool by approved means and is grounded near the outlet by some approved connection. It may be stated that though one side of the circuit may be grounded, it is not safe to ground the tool frame to this unless, by reason of polarized wiring, it is quite impossible to reverse the attachment plug in the outlet receptacle. The *safe* way is to ground by means of the third conductor.

The workman's part in handling the electrical equipment consists in the insertion of the attachment plug and connection of the ground, then handling, starting and stopping the tool or lamp as may be required in the course of the work. With the conductors properly insulated and the frame grounded, there should be little question of his safety.

Attachment Cords

Attachment cords probably are subject to more abuse than any other piece of electrical equipment. They are twisted, kinked, stepped on, run over by trucks and roughly treated in every way. Only the best cord should be used. Cord with a tough rubber insulation over the conductors and a reinforcement of the same tough rubber overall seems safest and most durable. While the cord should be made fast in attachment plug and tool in such manner that pulling on it will not strain the electrical connections, it should not be used to pull the attachment plug out of the receptacle nor to pull the tool or lamp about. A handle should be provided on both tool and plug for this purpose and it should always be used.

The cords and plugs must be inspected carefully at frequent intervals by the workman, the supervisor and the electrician. Where there is any sign of wear or damage, the cord or plug should be replaced with a new one. A taped covering is not satisfactory or safe, as oil or dirt may loosen the tape so that it will unwind. A cord should not be spliced for the same reason, but a continuous length used.

Lamp Sockets

A brass socket has no place in the portable lamp. The safe portable lamp has a non-conducting holder in which the socket is embedded and to which the lamp guard is attached. In gaseous atmospheres, or where there is exposure to flammable liquids, the portable lamp should be surrounded with a gas-tight glass globe, firmly attached to the holder and made tight by use of a gasket. The guard may be of metal or hard fibre, firmly attached to the holder.

In some locations, use of 32-volt lamps is recommended as a special precaution where men must work inside a boiler or tank where everything is a perfect ground and where men's clothing usually is soaked with perspiration. The low voltage is obtained by use of a small transformer between the workman and the outlet. Many small, isolated plants are designed for 32 volts; lamps for that voltage are readily obtainable.

Starting switches and compensators for large motors and other heavy equipment should have all metal handles and other parts grounded.

Fuses and Wiring

All repair and maintenance work involving exposure or handling of permanent conductors should be done by competent electricians. Fuses may be replaced by a foreman or assistant to avoid delay, but if they blow the second time and the cause of the trouble is not clearly apparent by a burned cord, smoke or odor of burning or overheated insulation, the electrician should clear the trouble.

Temporary wiring should be avoided. If it is necessary, it should be safely installed and removed as soon as it has served its purpose.

Constant vigilance will forestall trouble, help to maintain service during working hours, avoid the necessity of taking chances working on "live" equipment or rushing the job while workmen and machines stand idle.

Electrical Safety Equipment

Where work must be done on energized equipment, the electrician and helper should be furnished with properly approved safety devices. While the use of rubber gloves is not mandatory on 120-240-volt equipment, there are times when it will make the work much safer to use them. Gloves of approved make and quality with leather outer protectors, should be part of the electrician's equipment. Their use on 440 volts should be mandatory at all times. Rubber blankets should be provided to cover adjacent conductors and

grounded parts when necessary to work near them. Approved goggles should be worn when there is any danger from an arc or splashing solder, or from bits of insulation or dirt in the eyes.

Use Insulated Tools

Wood or fiber fuse tongs should be used in handling all fuses except those of the screw-plug type. There may be times when a switch stick or other simple "hot-line" tool may be desirable to avoid direct handling of low voltage conductors where there may be a hazard from direct contact. A light wood platform, with small line insulators and pins for legs will insulate the body from floor or ground. Insulated tool handles may afford protection on low voltage, but friction tape is of questionable safety. Some of the tool insulation on the market may be effective as an insulator but is highly flammable, so would be unsafe for use around a torch or furnace. The blow-torch must be kept in good condition to avoid the possibility of explosion. The electrician's ladders must be sound and well designed. Metal reinforcements that might invite a short-circut or ground are to be avoided.

Open Switches

When a switch is opened to de-energize a circuit on which work is to be done, it should be blocked open, locked in the open position with a padlock to which nobody but the electrician has a key, and a red "hold-off" tag, with full explanation as to who is working on the circuit, and what is being done, should be used. If locking and blocking the switch cannot be done, at least the tag should be used and the rule strictly enforced that nobody but the man placing the tag can remove it or close the switch.

The possibility of establishing an arc on low voltage equipment must be given major consideration. The current capacity of some shop systems is of considerable magnitude, especially around bus-bars and distribution centers. Dropping tools, solder, wire or other conductors across exposed bus-bars or other conductors may cause serious trouble. If the fuse or circuit-breaker responds instantly to the short-circuit, there may be only a momentary flash, but this may be quite destructive. Owing to its great heat, an electric arc may inflict serious burns and the actinic rays may affect the eyes seriously unless protected by proper goggles. The electric arc is also a serious fire hazard.

Cover Conductors and Grounds

If a tap must be made on an energized conductor, great care must be used to cover all adjacent conductors and grounds with rubber blankets. Unless a solderless connector is used, the joint will have to be soldered. It is not advisable to use an electric soldering iron in such a case, and the use of a gasoline torch might be unsafe. A soldering copper, heated in a flame, might be used, but soldering an energized conductor should be avoided if it is at all possible to de-energize it. In fact, *all* such work should be done on dead equipment, unless it is absolutely necessary that the work be done while it is "alive."

The use of voltage testing equipment, in the form of a lamp bank, voltmeter or other approved device, will remove any doubt as to voltage between conductors or between a conductor and ground. The *safe* procedure is to de-energize the circuit when working on it.

Hazards Must Be Recognized

Every workman, whether laborer, mechanic, or skilled electrician, should have the same respect for the common shop voltages of 120-240 volts as for the higher potentials. With the universal use of electrical energy, its hazards must be recognized and the simple means of avoiding accidents must be learned and habitually used. Constant and consistent inspection by plant safety department inspectors and directors, and a firm, inflexible insistence in the enforcement of plant safety regulation, will develop a keen sense and practice of personal responsibility in the average employee for not only his own safety but for his fellow worker's as well. When this is made an essential part of the job, electricity is as safe as it is useful.

Belgian Association Elects New President

GEORGES MORESSEE, one of the leading foundrymen in Belgium, has been elected president of the Association Technique de Fonderie de Belgique. Mr. Moressee has had a distinguished career. In 1904, he was elected to the Liege Association of Engineers and is past president, Association of Engineers of the Ecole de Liege. In 1930, he was general manager of the exposition Internationale des Sciences et de la Grande Industrie de Liege. He also is a student of note, having been awarded the gold medal of the Liege Association of Engineers in 1926 for studies relative to questions of physique.

Industrially, he is chairman, Compagnie des Compteurs et Manometres, Liege; chairman, Societe Anonyme Recsi, Liege; consulting director, Societe des Produits Chimiques de Vaux sous Chevremot, and director and member of the committee of management, Societe Anoyme des Mines de Verdin. For his many activities, he has been recognized by both the Belgian and Italian governments by being named commander of the Order of the Crown of Belgium and commander of the Order of the Crown of Italy.

Apprentice Training

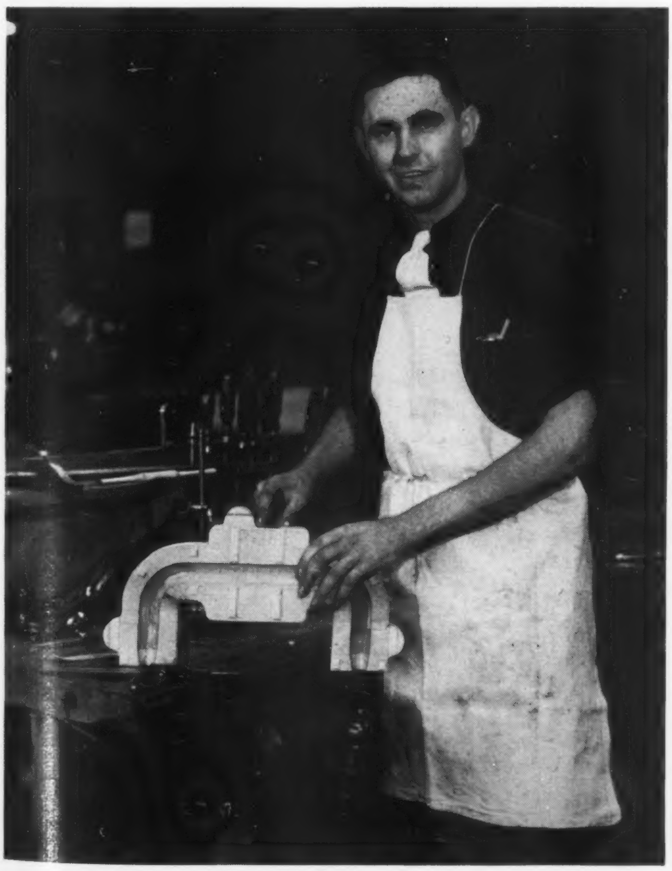
Training—A Responsibility of Management

By S. M. Brah,* Chicago, Ill.

THE PROBLEMS of business management are better understood by the chief executive than by other individuals or groups. In recent years, management has been and is faced with problems of a social nature that it did not have to consider before, due to legislative changes. Those social problems relating to personnel definitely point toward "Training" as a practical aid to their solution.

It has been said, "Business must train in order to survive." Today, this vivid statement is axiomatic with success in the foundry as elsewhere. Surveys show that the problem of skilled mechanics is as acute, or more so, than ever before.

*International Correspondence Schools and member A.F.A. Committee on Apprentice Training.



William Tharp, Caterpillar Tractor Co., Peoria, Ill., Winner of Third Prize in Pattern Making Contest at Cleveland Convention.

Any slight increase in production immediately creates a problem of finding the necessary man power to produce quality products as economically as possible. Training, in the broader sense, applies to every individual engaged in industry—managerial training for the executive, the art of managing men at work for the supervisory force, remedial training for the adult workers and apprenticeship for the newly inducted employe.

Apprenticeship is the foundation for all training. Good foremanship training necessarily should start with apprenticeship. Remedial or rehabilitation training of older workers will become unnecessary when all future employes have had the advantage of an apprenticeship.

Today, all legislation affecting the employer and his relations with his employes, definitely suggests the adoption of an apprentice training program as suggested by the A.F.A. Committee on Apprentice Training.

Training Should Be Systematic

Apprentice training, as suggested in the A.F.A. bulletin, is a systematic treatment of human material. Exercising care in selection, routing and scheduling the employe through various learning processes with supervision and control, and supplementary related instruction will assure a quality product not to be found at the employment gate. *"You can train better men for your work*—than the shop next door can train for you."

Now is the time to rehabilitate your man power. No plant likes to initiate new plans unless it can be assured that the plans have advantages and will improve the general well being of the plant. Assuredly business will improve. Ask yourself this question, "Is my man power ready to accept the challenge for the future?" You know your problems better than anyone else! Isn't Apprenticeship a good program for you NOW?

Wants Bound Volume 40

F. P. Gilligan, Henry Souther Engineering Co., Hartford, Conn., desires a copy of A.F.A. *Transactions*, vol. 40 (1932). Any member having an extra copy of this volume is requested to write Mr. Gilligan.

Chapter Directory

Chicago Chapter

Meetings—2nd Monday, monthly, Medinah Club of Chicago.
Chairman—L. H. Rudesill, Griffin Wheel Co.
Vice-Chairman—C. E. Westover, Burnside Steel Foundry Co.
Treasurer—C. C. Kawin, Chas. C. Kawin Co.
Secretary—L. L. Henkel, Interlake Iron Corp.
Directors—H. Kenneth Briggs, Western Foundry Co.
J. D. Burlie, Western Electric Co.
J. J. Fox, Wisconsin Steel Co.
A. W. Gregg, Whiting Corp., Harvey, Ill.
H. W. Johnson, Greenlee Foundry Co.
W. C. Packard, National Engineering Co.
W. H. Parker, American Steel Foundries, East Chicago, Ind.
G. P. Phillips, International Harvester Co.
C. O. Thieme, H. Kramer & Co.
James Thomson, Continental Roll & Steel Foundry Co., East Chicago, Ind.
A. W. Weston, Chicago Hardware Foundry Co., North Chicago, Ill.
L. J. Wise, Chicago Malleable Castings Co.

Northeastern Ohio Chapter

Meetings—2nd Thursday, monthly, Cleveland Club, Cleveland.
Chairman—L. P. Robinson, Werner G. Smith Co.
Vice-Chairman—Charles Seelbach, Forest City Foundries Co.
Treasurer—R. F. Lincoln, Osborn Mfg. Co.
Secretary—J. H. Tressler, Hickman Williams Co.
Directors—Homer Britton, Cleveland Cooperative Stove Co.
F. R. Fleig, Smith Facing & Supply Co.
E. F. Hess, Ohio Injector Co., Wadsworth.
D. J. McAvoy, Grabler Mfg. Co.
B. G. Parker, Youngstown Foundry & Machine Co., Youngstown.
Marcel Reymann, Atlantic Foundry Co., Akron.
S. P. Schloss, Superior Foundry Co.
Frank G. Steinebach, The Foundry.
Fred A. Stewart, National Malleable & Steel Castings Co.

Quad City Chapter

Meetings—3rd Monday, monthly, rotate between Davenport, Iowa; Moline, East Moline and Rock Island, Ill.
Chairman—M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill.
Vice-Chairman—H. A. Deane, Deere & Co., Moline, Ill.
Secretary-Treasurer—J. Morgan Johnson, Tri-City Mfrs. Assn., Moline, Ill.
Directors—P. T. Bancroft, Moline, Ill.
H. Bornstein, Deere & Co., Moline, Ill.
C. H. Burgston, Deere & Co., Moline, Ill.
T. J. Frank, Frank Foundries Corp., Davenport, Iowa.
F. O. Gorman, John Deere Spreader Works, E. Moline, Ill.
A. E. Hageboeck, Frank Foundries Corp., Moline, Ill.
H. F. Henninger, International Harvester Co., Rock Island, Ill.
John H. Ploehn, French & Hecht, Inc., Davenport, Iowa.
W. O. McFatridge, International Harvester Co., Rock Island, Ill.

Detroit Chapter

Meetings—3rd Thursday, monthly, Fort Shelby Hotel, Detroit.
Chairman—Ira F. Cheney, Griffin Wheel Co.
Vice-Chairman—Harry W. Dietert, H. W. Dietert Co.
Secretary—Harry J. Deutsch, Aluminum Co. of America.
Treasurer—Wm. W. Bowring, F. B. Stevens, Inc.
Directors—Glenn Coley, Detroit Edison Co.
R. B. Crawford, Atlas Foundry Co.
J. H. Crawley, Pontiac Motor Co.
L. G. Korte, Atlas Foundry Co.
D. J. Meloche, American Radiator Co.
J. D. Stoddard, Detroit Testing Laboratory.

St. Louis District Chapter

Meetings—2nd Thursday, monthly, St. Louis.
Chairman—J. O. Klein, Southern Malleable Iron Co.
Vice-Chairman—Lee Everett, The Key Co.
Secretary-Treasurer—J. W. Kelin, Federated Metals Div., American Smelting & Refining Corp.
Directors—M. A. Bell, M. A. Bell Co.
O. J. Belzer, Banner Iron Works.
L. J. Desparois, Pickands Mather & Co.
G. S. Haley, Century Foundry Co.
G. W. Mitsch, American Car & Foundry Co.
L. Reiber, United Collieries, Inc.

Metropolitan Philadelphia Chapter

Meetings—2nd Friday, monthly, Engineers' Club, Philadelphia.
Chairman—H. L. Henszey, The Carborundum Co., Philadelphia.
Vice-Chairman—W. C. Hartmann, Bethlehem Steel Co., Bethlehem, Pa.
Secretary-Treasurer—W. B. Coleman, W. B. Coleman & Co., 1920 W. Indiana Ave., Philadelphia.
Directors—C. A. Bever, Bethlehem Steel Co., Bethlehem, Pa.
J. T. Fegley, North Bros. Mfg. Co.
G. L. Coppage, Pusey & Jones Corp., Wilmington, Del.
L. W. Harris, Link-Belt Co.
R. J. Keeley, Ajax Metal Co.
John H. S. Spencer, H. W. Butterworth & Sons Co., Bethayres, Mont. Co., Pa.

Wisconsin Chapter

Meetings—3rd Friday, monthly, Schroeder Hotel, Milwaukee.
Chairman—Roy M. Jacobs, Standard Brass Works.
Vice-Chairman—Wm. J. McNeill, Federal Malleable Iron Co.
Treasurer—Wm. J. Donnelly, Smith Steel Foundry Co.
Secretary—B. D. Claffey, General Malleable Corp., Waukesha.
Directors—H. R. Donald, Interstate Supply & Equipment Co.
Ray Flansburg, Belle City Malleable Iron Co., Racine.
A. F. Genthe, Harnischfeger Corp.
Walter Gerlinger, Walter Gerlinger, Inc.
R. J. Kelly, American Skein & Foundry Co.
R. S. MacPherran, Allis-Chalmers Mfg. Co.
A. C. Ziebell, Universal Foundry Co., Oshkosh.

Northern California Chapter

Meetings—2nd Friday, monthly.
Chairman—John D. Fenstermacher, Columbia Steel Co.
Vice-Chairman—S. D. Russell, Phoenix Iron Works, Oakland.
Secretary-Treasurer—G. L. Kennard, San Francisco.
Directors—J. K. Benedict, H. C. Donaldson & Co., San Francisco.
F. C. Holman, Tuolumne Foundry & Machine Works, Sonora.
I. L. Johnson, Pacific Steel Casting Co., Berkley.
H. L. Martin, Vulcan Foundry Co., Oakland.
M. M. Morison, Balfour, Guthrie & Co., Ltd., San Francisco.
R. E. Noack, Monarch Foundry & Engineering Corp., Stockton.
W. A. Schimmelpfennig, California Foundries, Inc., Oakland.
M. G. Wilson, Wilson & Nutwell, Fresno.

Birmingham District Chapter

Meetings—3rd Friday, monthly, Tutwiler Hotel, Birmingham.
Chairman—C. B. Saunders, Tennessee Coal, Iron & R. R. Co.
Vice-Chairman—R. C. Harrell, Stockham Pipe Fittings Co.
Secretary-Treasurer—W. O. McMahon, Sloss-Sheffield Steel & Iron Co.
Directors—J. M. Franklin, Central Foundry Co.
C. A. Hamilton, Alabama Pipe Co.
J. E. Reynolds, U. S. Pipe & Foundry Co.
W. L. Roueche, Sr., McWane Cast Iron Pipe Co.
L. N. Shannon, Stockham Pipe Fittings Co.

Buffalo Chapter

Meetings—1st Monday, monthly, King Arthur's Restaurant, Buffalo.
Chairman—M. W. Pohlman, Pohlman Foundry Co., Inc.
Vice-Chairman—W. J. Corbett, Atlas Steel Casting Co.
Treasurer—R. K. Glass, Republic Steel Corp.
Secretary—J. R. Wark, Queen City Sand & Supply Co.
Directors—J. P. Begley, Pratt & Letchworth Co., Inc.
T. H. Burke, Otis Elevator Co.
J. McCallum, McCallum-Hatch Bronze Co.
V. M. Mazurie, Buffalo Foundry & Machine Co.
W. S. Miller, Chas. C. Kawin Co.
Lynn Reynolds, Worthington Pump & Machinery Co.
R. T. Rycroft, Jewell Alloy & Malleable Co., Inc.

Southern California Chapter

Meetings—4th Thursday, monthly.
Chairman—J. G. Coffman, Los Angeles Steel Castings Co., Los Angeles.
Vice Chairman—Bert Oldfield, Alhambra Foundry Co., Alhambra.
Secretary—M. S. Robb, Bethlehem Steel Co., Los Angeles.
Treasurer—Chas. Gregg, Reliance Regulator Co., Alhambra.
Directors—Earl Anderson, Enterprise Foundry Co., Los Angeles.
E. F. Green, Axelson Mfg. Co., Los Angeles.
Wm. Feltes, Westlectric Castings, Inc., Los Angeles.
Robert Gregg, Reliance Regulator Co., Alhambra.
S. R. Kimberly, Los Angeles Steel Casting Co., Los Angeles.
D. E. Lingenfelter, Quality Foundry Co., Los Angeles.
G. W. Merrefield, Kay-Brunner Steel Products Co., Los Angeles.
J. H. Wilkins, Dayton & Waldrip Co., Los Angeles.
J. E. Wilson, Climax Molybdenum Co., Los Angeles.

Metropolitan New York-New Jersey Chapter

Meetings—2nd Monday, monthly, Essex House, Newark, N. J.
Chairman—D. J. Reese, International Nickel Co., New York.
Vice-Chairman—W. E. Day, International Motor Co., New Brunswick, N. J.
Secretary—T. J. Wood, Robins Conveying Belt Co., Passaic, N. J.
Treasurer—Samuel Frankel, H. Kramer Co., New York, N. Y.
Directors—R. J. Allen, Worthington Pump Co., Harrison, N. J.
R. E. Nesbitt, Pratt Institute, Brooklyn, N. Y.
W. A. Phair, Iron Age, New York, N. Y.
J. W. Reid, Robins Conveying Belt Co., Passaic, N. J.
Sam Tour, Lucius Pitkin, Inc., New York, N. Y.

Northern Illinois and Southern Wisconsin Chapter

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Vice-Chairman—G. J. Landstrom, Sundstrand Machine Tool Co., Rockford, Ill.
Technical Secretary—H. C. Winte, Fairbanks, Morse & Co., Beloit, Wis.
Secretary-Treasurer—G. K. Minert, Gunite Foundries Corp., Rockford, Ill.
Directors—August Christen, Arcade Mfg. Co., Freeport, Ill.
C. M. Dale, Liberty Foundries Co., Rockford, Ill.
W. L. Davy, W. L. Davy Pump Co., Rockford, Ill.
W. E. Goff, J. I. Case Co., Rockford, Ill.
H. F. Halverson, Beloit Foundry Co., Beloit, Wis.
Eli Johnson, Greenlee Bros & Co., Rockford, Ill.
P. A. Paulson, Gunite Foundries Corp., Rockford, Ill.
A. W. Wiegart, Geo. D. Roper Corp., Rockford, Ill.
George Zabel, Fairbanks, Morse & Co., Beloit, Wis.

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Chairman—Joseph Sully, Sully Brass Fdry., Ltd., Toronto.
Vice-Chairman—D. J. Macdonald, Dominion Radiator & Boiler Co., Toronto.
Secretary-Treasurer—S. R. Francis, Metals & Alloys, Ltd., Toronto.
Directors—W. R. Barnes, Wm. R. Barnes Co., Ltd., Hamilton.
D. Cameron, John T. Hepburn, Ltd., Toronto.
N. B. Clarke, Steel Co. of Canada, Ltd., Hamilton.
O. W. Ellis, Ontario Research Foundation, Toronto.
C. H. Ley, Dominion Wheel & Fdries, Ltd., Toronto.
C. C. Macdonald, Fredercik B. Stevens Co. of Canada, Ltd., Toronto.
J. J. McFadyen, Galt Malleable Iron Co., Ltd., Galt.
D. M. Storie, Fittings, Ltd., Oshawa.

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Chairman—Jos. Sully, Sully Brass Foundry, Ltd., Toronto.
Vice-Chairman—H. J. Roast, Canadian Bronze Co., Montreal.
Secretary-Treasurer—D. J. McDonald, Dominion Radiator & Boiler Co., Ltd., Toronto.
Directors—Maj. L. L. Anthes, Anthes Foundry, Ltd., Toronto.
Emil Drolet, La Campagnie, F. X., Drolet, Quebec, P. Q.
O. W. Ellis, Ontario Research Foundation, Toronto.
W. C. Fletcher, Canadian Car & Foundry Co., Ltd., Montreal.
J. T. Hepburn, John T. Hepburn, Ltd., Toronto.
J. S. Hoyt, T. McAvity & Sons, Ltd., St. John.
A. C. Neal, Enamel & Heating Products, Ltd., Sackville, N. B.
Frank A. Sherman, Dominion Foundries & Steel, Ltd., Hamilton, Ontario.
A. G. Storie, Fittings, Ltd., Oshawa, Ontario.

Calendar of Fall Foundry Conferences

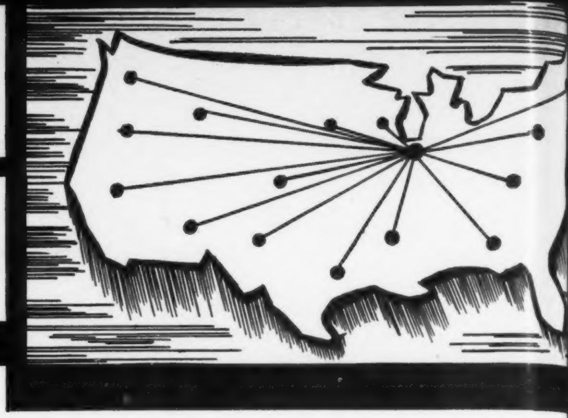
October 7-8—Rolla, Missouri—Second Annual Rolla Regional Conference. Sponsored by St. Louis Chapter in cooperation with Missouri School of Mines and Metallurgy. Chairman of committee: Louis J. Desparois, c/o Pickands Mather & Co., St. Louis, Mo. For program see pages 2-3 of this issue.

October 14-15—Iowa City, Iowa—Third Annual Iowa Conference. Sponsored by Quad City Chapter, Northern Illinois-Southern Wisconsin Chapter, Northern Iowa Foundrymen's Association, cooperating with State University of Iowa. Chairman of committee: Horace Deane, c/o Deere & Co., Moline, Ill. For program see pages 3-4 of this issue.

October 27-28-29—West Lafayette, Indiana—Regional Foundry Conference. Sponsored by Chicago Chapter in cooperation with Purdue University. Chairman of committee: Harold W. Johnson, Northwestern Foundry Co., 662 W. Roosevelt Road, Chicago. Tentative Schedule, pages 4-5 of this issue.

November 25-26—Ithaca, N. Y.—Second Northwestern New York Regional Conference. Sponsored by Buffalo Chapter, Syracuse Foundrymen's Association and A.F.A. members in district. Chairman of committee: Henry B. Hanley, American Laundry Machinery Co., Rochester, N. Y. Program will appear in October issue of *American Foundryman*.

Chapter Activities



Northeastern Ohio Chapter Holds First Meeting of Season

APPROXIMATELY 60 attended the first fall meeting of the Northeastern Ohio chapter of the A.F.A. held September 8 at the Cleveland club, Cleveland. Leroy P. Robinson, Werner G. Smith Co., Cleveland, and chairman of the chapter, presided. After announcing his committee appointments for the coming year, Mr. Robinson introduced F. G. Metzger, Cleveland Quarries Co., Cleveland, who described the quarrying and fabrication of silica firestone.

Motion pictures which illustrated Mr. Metger's talk showed the drilling, cutting, and hoisting of stone from the vast Ohio silica deposits. The shaping and fabrication of the stone in the mills was described by Mr. Metzger as it was shown on the screen. Many uses for sandstone have been found in the building industry, he said, and many statues and structures erected with the stone 20 or 30 years ago have not been damaged by erosion.

Ray Faller, Ethyl Gasoline Corp., New York, described problems of engineers who design high compression internal combustion engines. It has been found, he said, that ordinary fuels break down under the high pressure and temperature of the combustion chamber of the high compression engine. Such fuels ignite unevenly, creating knock and destructively wasted power. With slow motion pictures, Mr. Faller showed the effect of small additions of lead tetraethyl to high quality gasolines.

Southern California Chapter Holds Picnic

SOUTHERN CALIFORNIA CHAPTER held its First Annual Stag Picnic on August 20 at Lakewood Country Club, Long Beach, Calif. In reporting the success of the event, Chapter Secretary M. S. Robb says: "Over 300 attended this first 'shindig' of the Southern California Chapter and much of the credit for the grand success that it was, is due to the chairman of the Entertainment Committee, W. F. Haggman, Foundry Specialties Company." The program included tennis, golf, a ball game in the afternoon and a stag dinner and floor show.

Personnel of the entertainment committee, in addition to the chairman, consisted of J. G. Eberhardt, Kay Brunner Steel Products Co.; W. D. Bailey, Jr., Pacific Metals Co.; S. Mosony, Independent Foundry Supply Co.; D. C. Murray, H. C. Donaldson Co.; R. S. Smith, Cook Heat Treating Corp.; and S. S. Brown, H. L. E. Meyer, Jr., Co.

Help! Help!

THE STAFF of *American Foundryman* would like members to send to it action pictures which might be suitable for reproduction on the cover of the magaine. As has been the practice, credit lines will be run at the bottom of the picture giving the name of the company or individual sending in the photographs, whichever is desired. Glossy prints are preferred.

The photographs should show men working and not pieces of equipment alone. The staff will be indebted to members submitting such photographs.

Panorama View of Foundrymen Gathered for the First Annual Stag Picnic Sponsored by the Southern California Chapter of A. F. A. at Lakewood Country Club, Long Beach, Calif.

Abstracts

By E. J. Ash, Ann Arbor, Mich.

References and Bibliographies

THE following references to articles dealing with the many phases and ramifications of the foundry industry, have been selected by E. J. Ash, associate professor, Department of Metal Processing, University of Michigan, Ann Arbor, Mich., and the staff of *American Foundryman* from current technical literature. For the benefit of those desiring copies of complete articles, a list of publications together with their addresses is given below:

Proceedings, American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa.

Bulletin, British Cast Iron Research Association, 21-23, St. Paul's Square, Birmingham, England.

Canada's Foundry Journal, 85 Bellefair Ave., Toronto, Ont., Canada.

The Foundry, Penton Building, Cleveland, O.

Foundry Trade Journal, 49 Wellington St., London, W.C. 2, England.

Industrial Gas, 9 E. Thirty-Eighth St., New York, N. Y.

Industrial Heating, Union Trust Building, Pittsburgh, Pa.

Industrial Relations, 844 Rush St., Chicago, Ill.

Iron Age, 239 W. Thirty-Ninth St., New York, N. Y.

Journal, American Ceramic Society, Twentieth and Northampton Sts., Easton, Pa.

Machine Design, Penton Building, Cleveland, O.

Mechanical Engineering, 29 W. Thirty-Ninth St., New York.

Metal Industry, 22, Henrietta St., Strand, London, W.C. 2, England.

Metal Progress, 7016 Euclid Ave., Cleveland, O.

Metals & Alloys, 330 W. Forty-Second St., New York, N. Y.

Metals Technology, 29 W. Thirty-Ninth St., New York, N. Y.

Mining and Metallurgy, 29 W. Thirty-ninth St., New York, N. Y.

Product Engineering, 330 W. Forty-Second St., New York, N. Y.

Refractories Journal, c/o South Yorkshire Times Printing Co., Ltd., 2 Paradise St., Sheffield, 1, England.

Steel, Penton Publishing Co., Cleveland, O.

Trained Men, International Correspondence Schools, Scranton, Pa.

Transactions, American Foundrymen's Association, 222 West Adams St., Chicago, Ill.

Transactions, American Society for Metals, 7016 Euclid Ave., Cleveland, O.

When articles cannot be obtained from the original sources, photostatic copies may be obtained from the Engineering Society Library, 29 W. 39th St., New York, N. Y., which maintains photostatic service for engineering publications.

The A.F.A. maintains an extensive card file of references on many foundry subjects. Bibliographies compiled from this file are available to members at the cost of typing.

Alloy Cast Iron

PROPERTIES. See Cast Iron.

Atmosphere

CONTROLLED. *"Gases for Controlled Atmosphere—Requirements for Purification,"* by E. E. Slowter and B. W. Gonser, *Metals and Alloys,* vol. 9, no. 7, July, 1938, pp. 163-168. The purpose of this discussion is to give information on the effect on various carbon steels of small amounts of CO_2 and of CH_4 in dried generator gases from which most of the CO_2 has been removed. This includes gases representing the atmosphere produced by dry charcoal producers as well as the more common partly burned fuel gas generators.

Cast Iron

ALLOYS. *"Copper in Cast Iron,"* by A. J. Nicol Smith, *Foundry Trade Journal,* vol. 58, no. 1141, June 30, 1938, pp. 537-540; vol. 59, no. 1142, July 7, 1938, pp. 8-18. Paper describing the work carried out by the British Cast Iron Research Association and is extensive in scope. Some conclusions to be gained from this paper are: (1) Under normal casting conditions, the liquid solubility of copper in gray cast iron is about 5.5 per cent. Microscopic evidence indicates the solid solubility of copper is approximately 3.5 per cent. (2) In quantities up to 3.5 per cent, copper acts as a graphitizing agent, being about one-third as powerful as silicon. Further copper addition causes increase in chill. No tendency to decompose the carbide of pearlite has been noticed. (3) Hardness of gray iron is increased by copper dissolved in the matrix, although this hardness may be offset by decomposition of cementite. In the absence of graphitizing effect, the Brinell increases about 10 to 11 points per 1 per cent increase in copper. (4) Influence on transverse strength is slight, but favorable, with copper addition. (5) Copper has little effect on the microstructure of cast iron, but causes refinement of the pearlite and of the graphite structure. (6) Shrinkage is improved with copper up to 1 per cent. (7) The combined addition of copper together with one of the chilling elements, manganese, chromium or molybdenum, results in improved hardness and strength.

ALLOYS. *"Study of Influence of Manganese on Hardening and Tempering of Cast Iron,"* by J. E. Hurst, *Foundry Trade Journal,* vol. 58, no. 1141, June 30, 1938, pp. 545-546, 547. The author presents a number of properties of a series of centrifugally cast chromium (0.25 per cent) alloy cast irons containing manganese contents of 0.91, 1.43, 2.00, and 3.10 per cent in the as-cast, annealed, hardened and tempered conditions. The results show that in the as-cast condition, increase in manganese apparently has very little influence on the combined carbon content, but with 2 per cent and over, a marked reduction in the sulphur (0.074 to 0.034 per cent) is brought about. The Brinell hardness is increased but tensile strength, perma-

nent set value and modulus of elasticity are slightly lowered with increasing manganese. Results also are given for quenching from various temperatures, as well as the results of tempering and annealing.

CUPOLA CONTROL. *"Practices Close Cupola Control,"* by M. J. Gregory, *The Foundry,* vol. 66, no. 7, July 1938, pp. 24-27, 74. A continuation of the article appearing in the June issue. More data is given on control of the cupola. Much of the article discusses some of the irons used at the writer's plant.

CUPOLA OPERATION. *"Melting Scrap in the Cupola,"* by E. Piwowarsky and K. Achenbach (Technische Hochschule, Aachen: *Giesserei,* vol. 25, Feb. 25, 1938, pp. 74-80). Abstract from *Iron and Steel Industry,* vol. 11, no. 10, June 1938, pp. 494. "It is shown that massive iron is not carburized, but rather decarburized, by gases in the cupola shaft. Cementation by the coke present occurs only to a very limited degree. Steel melts as such and takes up carbon only in the cupola hearth. Factors influencing carburization are discussed at length and it is shown that for the melting of high steel mixtures, no more heat (and, therefore, no greater coke consumption) is required than for melting steel-free or low-steel mixtures. The chemistry of the reactions occurring in the cupola is discussed from the physical standpoint, and the reactions between the coke and blast at the higher temperatures necessary to melt steel are indicated; a method is explained whereby the pig or cast-iron scrap in the charge may be strongly superheated in the molten state before it reaches the hearth."

DEVELOPMENT. *"Fresh Milestone in the Development of Cast Iron,"* by A. B. Everest, *Foundry Trade Journal,* vol. 58, no. 1136, May 26, 1938, pp. 419-430. This brief article points out that the new specifications just issued by the B. S. I. have officially recognized cast irons of strengths higher than 22,000 lb. per sq. in. in tension. The new specification for 1938 lists three grades of iron, the highest grade having a minimum tensile strength of 40,000 lb. per sq. in. in the 1.2-in. diameter cast bar. The author attributes this change in recognized strength in cast irons to progress in heat-treating, alloying and other special processes, such as inoculation. The part played by nickel in meeting this specification is pointed out. It has been found by experience that in high duty castings of all types, a low temperature stress anneal is of great advantage where this can be included in the production. The castings are heated to 450° C. (approximately) for a suitable period (1 hr. for 1-in. thickness), which treatment eliminates casting strain and adds appreciably to the strength and impact resistance.

ENGINEERING. *"Cast Iron in Engineering Construction—II,"* by J. L. Francis, *Iron and Steel Industry,* vol. 11, no. 10, June 1938, pp. 471-473. The first portion of this paper appeared in the March issue of this publication. These articles deal with the physical properties of cast irons and the factors influencing them. It is suggested that high strength cast irons are not suitable for indiscriminate use for all castings. Large castings are likely to fracture under sudden impact or quick changes of temperature with low carbon, close grained structure metal. The closeness of structure, yielding high tensile values, is against that minute "give-and-take" so necessary to some castings. Too many variables exist in the metallurgy of cast iron for it to be amenable to exact mathematical calculation for prediction of properties. It has been demonstrated that with analysis and section size constant, the physical properties of cast iron depend on charge, cupola practice, and casting temperature. In testing transverse bars, the deflection or strain recorded when the load is on is the combined elastic and plastic deflection. On release of load, the material recovers from the elastic strain and permanent set remains. It has been found that the elastic strain curve is generally straight, although it does not always pass through the origin, but is usually close to it. A brief review of previously published data shows that subjecting cast iron to repeated restressing below its breaking load has a tendency to cause it to behave more in the nature of a truly elastic material.

FOUNDRY CONTROL. *"Gray Iron Foundry Control—Metallurgical Aids to Production,"* by A. R. Parkes, *Foundry Trade Journal,* vol. 58, no. 1136, May 26, 1938, pp. 417-418, 430. Foundries specializing in the manufacture of large numbers of ferrous castings come to depend more and more upon the standardization of material and the maintenance of standards within strict limits. It is the foundry metallurgist who is responsible for this. Economic dissemination of the results of physical and chemical tests in the light of experience is the function of the metallurgist. Metallurgical control begins with raw materials. These materials should not be purchased on competitive price without consideration of metallurgical value. The article discusses practical means of laboratory routine and mixing metal for the cupola. A series of sketches is given illustrating the construction of instruments for measuring blast pressure and blast volume. The latter values are considered essential for good cupola operation. It is pointed out that material cost of repetition castings should be based on cost per ton of good castings; cost of metal at the spout should not be considered; shop returned scrap should not be considered in cost evaluation. Cost per ton of good castings should be evaluated by taking the total value of issues of raw materials to the foundry and dividing by the tonnage of good castings which emerge from the cleaning shop over a certain period.

MACHINE TOOL. *Modern Manufacture of Machine-Tool Castings,"* by J. Blakiston, *Foundry Trade Journal,* vol. 59, no. 1142, July 7, 1938, pp. 3-7. The object of this article is to present a survey of present-day practice and developments which are taking place in the production of machinable gray-iron castings for machine tools. Machine-tool castings vary in weight from a few ounces to 50 tons and over, the section varying in thickness from 3/16 to 9 in. and over, with section variation of this order sometimes occurring in the same casting. Most castings of this nature require some machining and therefore must be sound, as well as machinable. Outstanding properties of cast iron which commend it to machine-tool manufacturers are listed and discussed. A total of fifteen illustrations are included, including micrographs, molding sketches and equipment. Melting in the Brackelsberg furnace is covered, including molding methods.

Copper

CAST IRON. See Cast Iron.

Cupola Operation

CAST IRON. See Cast Iron.

Defects

NON-FERROUS. See Non-Ferrous.

Design

MALLEABLE. *"Design for Malleable Castings Is Important,"* by J. H. Lansing, *The Foundry,* vol. 66, no. 7, July 1938, pp. 22-23; 71-72. The beginning of this article cites a recent experience of a large motor truck corporation which utilized the facilities of a malleable iron producer for a program of special training of its engineering personnel. Instructions were given in pattern making, melting, molding, core making, pouring, annealing, etc. Design was emphasized with regards to service conditions and difficulty in founding. Some of the fundamental factors relating to design are discussed, as are factors in determining the needed finish allowance.

STEEL. *"Alloy Steels Designed for Specific Uses,"* by V. T. Malcolm, *The Foundry,* vol. 66, no. 7, July 1938, pp. 32-33, 80, 83. Special steels are divided into a number of classes as follows: (1) Steels which are necessary for added strength, (2) steels for wear resistance, (3) steels to resist creep and elevated temperature, (4) steels for welding, (5) steels for resistance to corrosion and oxidation, and (6) steels that are free machining and nonseizing. The part played by alloys in these steels, such as nickel, chromium, molybdenum and chromium-molybdenum, is mentioned. Alloy steels because of their deep hardening properties are suited for production of large castings. The variables encountered in the manufacture of steel castings are listed. One table of recommended chemical composition of alloy steel castings is given. A second table gives the recommended heat treatment and physical properties for alloy steel castings.

Enameling

OXIDATION. *"Oxidation and Adhesion,"* by James White, *Foundry Trade Journal,* vol. 59, no. 1142, July 7, 1938, pp. 14-16. A knowledge of the high temperature chemistry of iron oxides is of some importance to enamelers. Whether or not adhesion is dependent on the oxides' presence in the ground-coat in the vicinity of the metal surface, it is certain that by their presence they will materially affect the properties of the enamel. This paper discusses the system iron-oxygen at high temperatures; oxygen pressures of the oxides of iron at high temperatures; behavior of F_2O_3 in presence of SiO_2 and CaO; mechanism of gas-oxidation in the open-hearth furnace; part played by atmospheric oxygen during the enameling of iron; and the function of the adhesion-producing oxides. Seven figures are included.

SAND-BLAST. *"Sand-Blasting as Applied to the Vitreous Enamelling Process,"* by H. Whitaker, *Foundry Trade Journal,* vol. 59, no. 1142, July 7, 1938, pp. 12-13. This article is a general discussion on sand-blasting. The object of blasting, choice of plant, output of plant which depends on air pressure, air capacity, bore and type of nozzle, nature of abrasive and type of plant, operating troubles, silicosis and a few suggestions in which manufacturers might improve their service are covered in this brief paper.

Gases

METALS. *"Gases in Metals and Their Influence on Adsorption, Absorption and Chemical Reactions,"* by Henry Lepp, *Metal Industry,* vol. 33, no. 2, July 8, 1938, pp. 27-30; no. 3, July 15, pp. 59-63; discussion to be continued in subsequent article. In this present publication, the author goes into the fundamentals of gas-metal reactions of all types, emphasizing that the absorption of gases by metals is

a chemical, not a physical, process, and that the laws of thermodynamics are applicable to these systems. Starting from this basis, an attempt has been made to solve the problem of obtaining a metal free from both oxygen and impurities of a reducing nature. The two simple methods of achieving this are respectively the method of producing an over-oxidizing condition, followed by a reduction so that finally no deleterious impurities remain, and the method of over-reduction followed by the oxidation of the excess reducing agents. Both of these methods have disadvantages and the author has tried to solve the problem by controlling the oxidation so as to oxidize the impurities of a reducing nature. By this means, it is claimed, the metal is sufficiently deoxidized and degasified and that the mechanical properties of the resulting material are greatly improved. Gases are classified according to their construction and composition as follows:

1. Simple diatomic gases: O_2, H_2, N_2 and the rare gases.

2. Oxide gases: SO_2, H_2O, CO_2, CO, NO.

3. Other complex gases: C_x Y_y $(CN)_2$, NH_3, H_2S, PH_3.

First the effect of temperature and pressure on the behavior of these gases, when they are in contact with pure metal, are analyzed and discussed; a discussion of the alloy-gas systems is then considered.

Inclusions

OXIDE. *"Extraction of Oxide Inclusions in High Carbon Iron—Electrolytic Iodine Method,"* by F. W. Scott, *Metals and Alloys,* vol. 9, no. 7, July 1938, pp. 171-174. Foundrymen have observed that the physical properties of a gray iron casting are affected by something in the pig iron from which it was made that is not shown by the usual chemical analysis. At the present time, several hypotheses are under consideration which suggest that graphitization is dependent upon the presence of non-metallic inclusions which act as nuclei for the formation of the graphite flakes during the freezing of the iron. It is the hope of the author that with the development of a method for the determination of the oxides in cast iron that experimental data will be obtained that will enable an understanding of the phenomenon under consideration. In this paper, the first of two, a resume of the literature is given.

Malleable Castings

DESIGN. See Design.

Melting

NON-FERROUS. *"Melting Non-Ferrous Metals,"* by N. K. B. Patch, *The Foundry,* vol. 66, July 1938, no. 7, pp. 28-77. Care of refractories is discussed. Type of combustion should be carefully observed. Furnaces should be cleaned of slag after each day's run. It is recommended that the life of a furnace lining should be given in number of pounds of metal melted. A new lining always absorbs some of the metal melted upon it and finally reaches a point where it is saturated. There is, therefore, an opportunity for some contamination when a different alloy is made. A contaminated lining can be washed relatively clean by melting down a heat or two of scrap copper. Since ladles also absorb metal, care should be exercised to prevent contamination.

Non-Ferrous

FOUNDRY DEFECTS. *"Foundry Defects—An Analysis of Their Cause,"* *Metal Industry (London)*, vol. 33, no. 2, July 8, 1938, pp. 33-34; also A.F.A. Preprint 38-1 at the recent A.F.A. Convention in Cleveland and prepared by the Committee on Analysis of Casting Defects, Non-Ferrous Division. Defects are listed according to their appearance, evident to the eye, and after each defect reference to the probable cause or causes is given. The material is concentrated. Defects considered are sixteen in number, and the probable causes listed are greater in number. Probable causes are: (1) The mold must be so placed that molten metal in the sprue will be substantially above the level of the highest casting; (2) the gates leading to the individual castings in the mold must be large enough to permit free flow of the metal; (3) if sand is too wet, it may chill the metal excessively; (4) sluggish metal may cause misruns as a result of contamination by impurities; (5) metal which is sluggish because it is too cold will often cause misruns; (6) if pouring is interrupted or slackened before complete, a misrun may result. Other defects such as shift, cold shut, crush, swell, variation in wall thickness, sand wash, scab, sand blow, burning into sand, etc., are likewise analyzed for probable causes. Practical information.

FOUNDRY PRACTICE. *"Non-Ferrous Foundry Practice—IX—Unsoundness in Bronze Castings,"* by J. Laing and R. T. Rolfe, *Metal Industry (London)*, vol. 33, no. 3, July 15, 1938, pp. 51-54. Porosity in castings is divided into two general classes: Major porosity, or large cavities developed through insufficient feeding; and minor porosity, which appears under water tests and may be termed "intercrystalline" shrinkage. Results of other workers are reviewed. Intercrystalline shrinkage is considered not solely due to pure shrinkage, but is associated with the rejection of gases at the grain boundaries. However, intercrystalline shrinkage may also be attributed to lack of proper gating and risering, and may be promoted with low pouring temperature. Bolton and Wiegand concluded that porosity was caused by the use of reducing atmospheres and could be eliminated. An A.F.A. report concludes that alloys containing reactive oxides in a reducing atmosphere or in one containing sulphur produces intercrystalline shrinkage and oxidized metal. Hydrogen unsoundness is attributed generally to the reaction of hydrogen during solidification with zinc oxide causing steam. Darby recommends melting in a reducing flame but heating the molten metal under an oxidizing flame. The present authors present experimental data indicating that when using a flux covering on the bath (boro-calcite and charcoal), the melt is not sensitive to the type of atmosphere used in the furnace. This article is practical in its scope.

Porosity

NON-FERROUS. See Non-Ferrous.

Refractory

SERVICE. *"Refractory Service Increased Through Study of Problem,"* by S. M. Swain, *The Foundry,* vol. 66, no. 7, July 1938, pp. 29-30, 78. This article is from a paper presented before a regular meeting of the Wisconsin Chapter of the A.F.A. at Milwaukee. This article points out one method of analyzing refractory problems with the view of assisting in attempts to improve service. Various steps in obtaining data are given. Conditions of the cold furnace, function of mineral composition, improper drying conditions, iron oxide as a flux and other points are discussed in this paper.

Sand

MOLDING. *"Molding Sand with Special Reference to Blind Scabs,"* by S. Carter and A. W. Walker, *Foundry Trade Journal,* vol. 58, no. 1136, May 26, 1938, pp. 423-426, 428. This paper gives some interesting experiences and data on sand control by the authors. It is illustrated with eleven figures and seven tables of data. The authors observed that sand grains gradually increased in size with repeated use, owing to the adherence of silt particles, to larger grains. (Data relative to the method of determining grain size is lacking.) The expansion of silica grain is doubted as a cause of scab. A method for visually observing the formation of a scab is described but means of remedy has not been found. It is stated that the blind scab is formed before the metal reaches the actually defective area and that standing metal appears to produce the effect to a greater extent than does flowing metal. In this connection, balanced runners do a great deal to mitigate the trouble when it is found to be due to stationary pools of metal on the mold surface. An attack is made on the excessive use of coal dust in heap sand and explains that coal dust tends to produce gas. A case is cited in which the elimination of coal-dust from a heap also eliminated troubles from blowholes.

Steel

PRODUCTION. *"Production Data of the Steel Foundry Industry for 1937,"* by E. F. Cone, *Metals and Alloys,* vol. 9, no. 7, July 1938, pp. 178, 181. By indirect calculations, the output of miscellaneous and special commercial steel castings made in net tons for the last four years is as follows:

Year	"A"	"B"	"C"
1934	375,122	395,000	476,000
1935	368,851	388,200	467,700
1936	718,068	755,800	910,000
1937	907,674	955,400	1,151,000

"A" are actual figures obtained from the Steel Founders' Society of America. *"B"* are estimated output of all producers on the basis that the Society's statistics represent 95 per cent of the output. *"C"* are figures on estimated production of the foregoing plus the output of those companies which produce castings for their own use. This figure is arrived at on the basis of considering *"A"* plus *"B"* representing 83 per cent of the total output.

Steel Castings

DESIGN. See Design.

Tools

CAST STEEL. See Steel.

White Iron

CUPOLA. *"White Cast Iron,"* by P. L. Ward, *Foundry Trade Journal,* vol. 58, no. 1137, June 2, 1938, pp. 441-443. The type of white iron discussed is cupola melted, and is used as an abrasion and attrition resisting medium in the form of balls, and liners for mills, pump impellers and liners, shute and launder liners, etc. For wear-resisting purposes, sections up to 5-in., the silicon control must be strict, about 0.6 per cent; sulphur low, about 0.2 per cent; phosphorus, 0.3 per cent; sufficient manganese to balance the sulphur; carbon between 2.7 and 3.0 per cent. The author describes the melting practice, molding, and temperature measurements. The effects of constituents of white iron are given. A method of testing castings for abrasion resistance is given. Hardness tests are also used.

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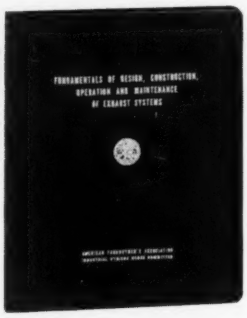

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